DERWENT-ACC-NO: 1988-218170

DERWENT-WEEK: 198831

TITLE: Self-aligning doping process - using oxidised dopants deposited on patterned wafers, with subsequent annealing

PATENT-ASSIGNEE: ANONYMOUS[ANON]

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PATENT-FAMILY:

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BASIC-ABSTRACT:

Self-aligned, shallow pn-junction on silicon having high dopant concns. can be
achieved with fewer process steps by depositing oxidised forms of dopants on patterned wafers with subsequent annealing.

In the first step, wafer areas to be doped are either bare silicon or have a native thin oxide, and undoped areas are covered with a protective layer, such
as silicon dioxide or silicon nitride up to 200 Angstroms thick. Oxidised dopant is next deposited. This may be done by any of several mechanisms. For
example, with mol. exchange reaction, a solid boron oxide, boron hydroxide or boric acid source is exposed to a gas stream at a temp. less than 140 deg.C that carries molecules to the silicon surface. This is pref. done in the mol. flow range to ensure homogeneous coverage and to permit high packing density of

exposed wafers. The dopant may be added with low pressure chemical vapor deposition (LPCVD); the lack of reaction with the silicon dioxide furnace reduces mol. sticking coefficient and allows rather abrupt interfaces. Dopants
may alternatively be deposited by evaporation, as in mol. beam epitaxy, or by dipping in aq. solns..

The last step is redn., thermal activation and drive-in. Annealing at 600-800 deg.C may be used to react the oxidised dopant with silicon via silicon oxide formation which has to be permitted to escape to obtain the elemental dopant,
requiring a reducing atmos.. Electrical activation and thermal drive-in can be
done in an inert atmos. in a clean LPCVD furnace, an annealing furnace or a rapid thermal annealing appts.; with the latter, dopant reduction is done at 600-650 deg.C for some minutes, then a brief annealing is done at 900-1200 deg.C for the drive-in.

USE/ADVANTAGE - This doping process lends itself to self-aligning, which is
accomplished by hindering a reaction and not by use of a diffusion barrier.

TITLE-TERMS: SELF ALIGN DOPE PROCESS OXIDATION DOPE DEPOSIT PATTERN WAFER
SUBSEQUENT ANNEAL

DERWENT-CLASS: L03 U11

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